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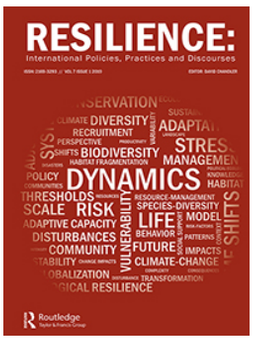

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Sustainability or resilience? A case study in the semi-arid Pampean region of Argentina

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ABSTRACT

Rural areas are being confronted with rapid changes and uncertainties in agricultural, forestry and landscape services which affect their future, and Argentina is no exception. Because of the dynamic and complex nature of rural systems, and because we are dealing with an interdependence between humans and ecosystems, resilience theory could be a useful framework for analysing rural areas regarding their ability to cope with change. Following a review of literature on sustainability and resilience, we introduce the case study, provide qualitative findings from our research and then analyse these results in relation to rural resilience in semi-arid areas such as the Pampean region. We open up new perspectives on resilience within the rural studies debate and make an original contribution providing an approach to reframe development theory and practice in rural areas of Argentina.

KEYWORDS

Rural resilience; sustainability; semi-arid areas; Pampean region

Introduction

Debate on resilience as a new paradigm for understanding the behaviour of socio-ecological systems is a recent development (Bousquet et al., 2016; Davidson, 2010; Heijman, Hagelaar, & Heide, 2007). More than many other concepts, resilience represents the adaptive and evolutionary dynamics which permit systems (including rural communities) to respond to disturbance and change (Imperiale & Vanclay, 2016). Within the context of economic turbulence and ecological instability, the concept has gained prominence both in political rhetoric and in research (Darnhofer, Lamine, Strauss, & Navarrete, 2016). It is to some extent replacing sustainability in policy discussions (Wilson, 2012) and as a defining concept for rural development (Freshwater, 2015). Resilience thinking opens up new perspectives and provides the potential to reframe rural studies debates (Scott, 2013).

From an evolutionary perspective, resilience emphasises that to persist in the long term, a system needs to be able to change (Darnhofer et al., 2016). Resilience is thus conceived as the capacity of an individual or community to cope with stress, overcome adversity, adapt positively to change (Folke et al., 2002; Zwiers, Markantoni, & Strijker, 2016) or transform in

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response to stresses (Carpenter, Westley, & Turner, 2005). In resilient systems, change can create opportunities for development, novelty and innovation (Folke et al., 2002). Therefore, rural community resilience can be defined as the ability of a group to deal with external threats and adjust to changes while balancing its social, economic and physical functions (Zwiers et al., 2016). This perspective is based on the idea that ecological, economic and cultural systems are becoming increasingly intertwined, and interactions between these systems increase in intensity and scale. It is not surprising that rural resilience builds on the interface with other types of resilience, in particular economic, ecological and cultural resilience (Adger, 2000; Heijman et al., 2007).

Rural areas are being confronted with rapid changes and uncertainties in agricultural, forestry and landscape services which affect their future (Heijman et al., 2007), and Argentina is no exception. Because of the dynamic and complex nature of rural systems, and because we are dealing with an interdependence between humans and ecosystems, resilience theory could be a useful framework for analysing rural areas regarding their ability to cope with change (Kummer, Milestad, Leitgeb, & Vogl, 2012). We will analyse whether the concept offers a fruitful alternative to the concept of sustainability. To test this, we use case study research in the semi-arid rural areas of the Pampean Region, specifically the Patagones district. From 1970 to the present, the territory in that region has been incorporated into the new, globalised agricultural production (from extensive livestock farming to cereal crops under dry-land conditions for external overseas markets) (Viglizzo, Pordomingo, Castro, & Lertora, 2003). Today, the district is confronted by strong socio-economic and environmental changes and challenges, especially after drought periods which caused a complex mix of physical, financial and social impacts (Andrade, Laporta, & Iezzi, 2009; Ferrelli, 2012; Gabella, 2015).

Although the use and analysis of the concept of resilience is increasingly common in international scientific journals from Western 'developed' countries, in Latin America and especially in Argentina, debate and research on socio-environmental degradation in rural areas is still mostly related to sustainability and not resilience. That is why the aim of this paper is to analyse this area and its processes through the lens of rural resilience. By doing so, we will explore how the concept can be more useful than the concept of sustainability, and what the importance of resilience theory is within rural areas.

Following a review of literature on sustainability and resilience, we introduce the case study, provide qualitative findings from our research and then analyse these results in relation to rural resilience in semi-arid areas such as the Pampean region. We aim to open up new perspectives on resilience within the rural studies debate and make an original contribution providing an approach to reframe development theory and practice in rural areas of Argentina. We also analyse these processes from the perspective of human geography, critical of the classic concepts of resilience that Wilson (2017) conceptualised as a fourth constructive tension, an explicitly 'geographical' approach to understanding tensions in resilience. In this sense, the analysis will also assess whether the notion of resilience is destined simply to remain an abstract scientific concept, or whether it actually helps solve real problems facing humanity.

Sustainability and resilience

Sustainability and resilience are two highly abstract concepts, each of which has a multiplicity of definitions (Derissen, Quass, & Baumgartner, 2011) and several levels of meaning, from

the metaphorical to the specific (Carpenter, Walker, Anderies, & Abel, 2001). Sustainability refers to the long-term ability to continue to engage in a particular activity, process or use of natural resources (Benson & Craig, 2014), and since 1987, when the Brundtland Comission defined it as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987), has been associated with the concept of sustainable development. It means a kind of development which can be continued either indefinitely or for a period of concern (Sharachchandra, 1991). The definition of sustainability includes the idea of intra and intergenerational justice (Derissen et al., 2011).

Like sustainability, resilience is a concept which has many definitions and implications (Freshwater, 2015). Resilience can be characterised as the amount of change the system can undergo while still retaining the same controls on function and structure, meaning the degree to which the system is capable of self-organisation and building and increasing its capacity for learning and adaptation (Carpenter et al., 2001). From a social perspective, Davoudi et al. (2012) suggest four key issues for a better understanding of resilience: (1) the intentionality of human actions, (2) the purpose of resilience for local communities, (3) defining the system boundary and (4) issues related to power and politics, justice and fairness.

Related to this social approach, community resilience is also influenced by place attachment. Perceptions regarding the environment are important for resilience, along with feelings of belonging, the local economy and community spirit over time. The emotional bonds between people and places are complex, but they are highly significant in people's attitudes and behaviour in relation to the sustainable future of their communities (McManus et al., 2012; Zwiers et al., 2016). Policy-makers, practitioners and social scientists agree that community participation is key to creating resilient and vibrant communities. People–place relationships should be included in research, policy and community intervention programmes on resilience for the creation of adaptive communities (Zwiers et al., 2016).

Resilience or sustainability: sustainability of what, resilience for whom?

Resilience is regarded in some contributions as a necessary precondition for sustainability (Derissen et al., 2011). Both concepts deal with the future. According to Carpenter et al. (2005), from a practical standpoint resilience theory provides a conceptual basis for sustainability. Indeed, if we assume that 'sustainability is the ability of a system to maintain productivity in spite of a major disturbance, such as that caused by intensive stress or a large perturbation', then we see strong similarities between the concepts of sustainability and resilience. In this sense, while sustainability is achieved through changes to a system, the ability to tolerate change or reorganise multiple structures and procedures is the resilience approach in action (Folke et al., 2002).

The adoption of resilience thinking is viewed by a number of authors as a means to further elaborate sustainable development as a concept (Scott, 2013). Some authors agree that there is a connection between resilience and sustainability (Wilson, 2017). Heijman et al. (2007) understand the notions of resilience and sustainability as being almost equivalent. Others, however, see subtle differences between the two concepts. There are advocates who argue that sustainability continues to provide an overarching concept which includes consideration of resilience pathways as crucial components of a transition towards a more sustainable society (Wilson, 2017).

However, despite the many connections between resilience and sustainability, they are not incompatible but independent concepts (Derissen et al., 2011). Beyond specific definitions, we argue in this paper that sustainability is about defence, resilience about adaptation. We understand defence as resistance to change, instead of transformation. Defence covers strategies a system can adopt to maintain the status quo. Defence can vary, depending on the system, but it generally means that aspects of a system are rigid and resistant to changes and new scenarios.

Sustainability assumes that there are desirable states of being for socio-ecological systems that humans can maintain indefinitely. That means that we know what can be sustained (sustainability of what?). In contrast, resilience includes disequilibrium and nonlinear changes within socio-ecological systems and is about adaptive capacity and management rather than maintaining stability (Benson & Craig, 2014). Adaptive capacity is a component of resilience which reflects the learning aspect of system behaviour in response to disturbance (Gunderson, 2000). The value is its emphasis on uncertainty, disruptions, future surprises or unknowable risks and how periods of gradual change interact with periods of rapid change and how such dynamics interact across temporal and spatial scales (Folke, 2006).

Rural areas are often defined by reference to the three classical pillars of sustainability (environmental, economic and social), frequently seen statically and normatively, while the notion of resilience is defined more dynamically in terms of the ability to cope with shocks and stresses. Resilience involves changes, adaptation and reorganisation of systems over time. One concept refers to permanence, while the other means movement. This means that resilience is more closely related to flexibility and to change than to continuing to do the same thing.

Resilience thinking also offers a theoretical framework for assessing cross-scale dynamics. A resilience approach reorients current research and policy efforts towards coping with change instead of increasingly expensive efforts to maintain existing states of being (Benson & Craig, 2014).

Rural resilience: strengthening the system against vulnerability

Rural areas are dynamic socio-ecological systems made up of social, economic and ecological components interacting together, constantly changing, never in balance. Rural areas face dynamics and disturbances induced by local, regional, national or global trends or shocks. Changes which impact on agriculture, such as rising energy prices, market fluctuations and climate change, raise the question of how to sustain ecosystem services from agriculture (Kummer et al., 2012). The importance of applying resilience thinking to farming is understandable given that agricultural and ecological systems are not just linked, but are truly interconnected and co-evolving in terms of producing food while maintaining ecosystem functions and services (Folke, 2006). Vulnerability is the flip side of resilience: when a social or ecological system loses resilience it becomes vulnerable to change which could previously be absorbed or managed (Kasperson & Kasperson, 2001). Because rural regions are inherently exposed to high levels of risk, and have significant constraints on their ability to mitigate it, developing a way to achieve greater resilience is both crucial and difficult (Freshwater, 2015).

Based on a number of case studies, Folke, Colding, and Berkes (2003) suggest four principles which build resilience in social-ecological systems. The first, learning to live with change and uncertainty, focuses on the need to learn from crises and to acknowledge the

existence of uncertainty and surprise in development. The second, nurturing diversity for reorganisation and renewal, emphasises the need to use ecological and social diversity when coping with change. Ecological diversity consists of the diversity of species within and between functional groups. In social terms, diversity is enhanced when individuals, institutions, organisations and other actors have different and overlapping roles. The third, combining different types of knowledge for learning, acknowledges that both scientific and popular knowledge are important to developing the local ecological knowledge needed to build resilience. Knowledge of different actors and groups is thus relevant. Finally, Folke et al. (2003) suggest creating opportunities for self-organisation. In the case of farming, this relates to the ability of farmers to maintain capacity for self-organisation rather than relying on external intervention.

Previous research on rural semi-arid areas (Alary, Nefzaoui, & Ben Jemaa, 2007; Bjorkhaug & Richards, 2008; Bossio, Geheb, & Critchley, 2010; Carrión et al., 2010; Cocklin, Mautner, & Dibden, 2007; Cuéllar-Padilla & Calle-Collado, 2011; Easdale & Rosso, 2010; Frost, Campbell, Luckert, Mandondo, & Kozanayi, 2007; Hoggart & Paniagua, 2001; Holmes, 2006; Hurni, 2000; Kelly et al., 2015; Madsen & Adriansen, 2004; Pierce, 1996; Reed & Dougill, 2010; Rist et al., 2007; Van Lier, 1998; Verdoodt, Mureithia, Ye, & Van Ransta, 2009; Weissteiner et al., 2011; Yayneshet, Eik, & Moe, 2009) has found that general systems which are not interconnected tend to be less resilient. The greater the separation (ecological, economic and cultural) between these systems, the greater their vulnerability and the risk of uncertainty and surprise. If an area is not economically resilient (meaning that it is vulnerable to economic shocks and crisis) the population gradually moves away and vulnerability increases further. This is what Kelly et al. (2015) affirm in their research: 'The decline in farm incomes deters young people from entering the agricultural sector and, together with a lack of an entrepreneurial culture, leads to rural out-migration, farm fragmentation and, eventually, land abandonment, further exacerbating land degradation issues' (Kelly et al., 2015, p. 16).

This increased vulnerability means that it takes progressively smaller shocks to cause chaos and crisis in the rural system. Even small changes can be devastating to a vulnerable system. If the region is not ecologically resilient, the conditions for agriculture for instance will deteriorate, further increasing vulnerability. When a rural area depends on a single crop, it is less resilient. A rural system which is more diversified in its crops, production and markets will be less vulnerable to external factors associated with variability in the weather and fluctuating international prices.

Cultural resilience is also a necessary condition for rural resilience because it ensures the presence of sufficient human capital in the region. The concept of cultural resilience is otherwise known as social resilience (Heijman et al., 2007). The cultural domain encompasses societal norms, conventions, traditions, rites and ideologies. These, in turn, affect the quality of economic, social and natural domains at community level (Kelly et al., 2015). Therefore, declining cultural resilience contributes to the vulnerability of a rural system. That is why the concept of place attachment and belonging (Zwiers et al., 2016) in these areas is important, because the emotional bonds between people and places are helpful to consolidate and also help to generate greater participation and collective commitment. Communities are therefore often deeply entrenched within the social memory and ideology of the societies of which they are a part (Kelly et al., 2015).

Resilient systems not only need to tolerate and resist external shocks and crises, but also to have some flexibility to enable the system to adapt and ultimately to turn new

circumstances to their advantage. This can also help turn crises into opportunities for development. There needs to be knowledge, practices and social mechanisms which comprehend these dynamics – such as disturbance, change and crisis – as part and parcel of development. The rapid development of rural areas in Latin America is often approached through the lens of sustainability. In this paper, we will apply the concept of resilience to better understand it.

Methodology

This research strategy is based on the case study method, which enables the investigation of the significant characteristics of real-life situations and trends more holistically. It allows us to learn about processes and procedures in depth and thus advance our research by analysing general patterns for similar cases (Yin, 2003).

The chosen district is Patagones, located in the South of Buenos Aires province and, within it, the analysis focused on rural areas of dry land, comprising an extension of 13,597 km^2 (1,402,639 has.) and approximately 650 farmers (http://www.indec.gob.ar/). Quantitative and qualitative approaches were combined throughout the research process. Quantitative methods support the identification of structural aspects which determine the behaviour of actors and stakeholders in a macro social framework. At the same time, the qualitative methodological approach details and underpins the social phenomena from the actors' (civil society) perspective, representing the meaning or sense that the local population ascribes to reality. The proposed research thus permitted merging the two approaches through 'triangulation', which makes the phenomena and their different stages easier to understand (Bogdan & Taylor, 1994).

With regard to data collection, the primary sources include fieldwork, direct and indirect observation, interviews and surveys. We draw on data from 40 formal interviews conducted between 2013 and 2015 in different locations in the study area: cities, towns, research institutes, public offices, private homes and farms. During field trips or fieldwork, a work pattern/flow (Gaber & Gaber, 2007) was conducted, collecting information and focusing on qualitative data. Interactive observation was performed through semi-structured interviews with various kinds of social actors: farmers, rural workers, agricultural producers, rural contractors (all those making a living from land, either the agricultural workers themselves or landowners and agricultural firms, and who may or may not live in the countryside); (agricultural and environmental) experts; extension agents and managers (working and retired) from the INTA (National Institute of Agricultural Technology (http://inta.gob.ar/)); state and local officials; agents and professionals from the private sector as well as professors and researchers from the National University of the South (https://www.uns.edu.ar/) and CONICET (http://www.conicet.gov.ar/).

Secondary sources of information include national and international research papers and results, community information, statistical data and general maps of the area (from the Office of Agricultural Affairs of Buenos Aires province (http://www.maa.gba.gov.ar/2010/index.php), the Municipality of Patagones District (http://www.patagones.gov.ar/), the National Institute of Statistics and Census (INDEC) (http://www.indec.gob.ar/). The results of the 1988 and 2002 National Agricultural Censuses were analysed, as well as those from the 2001 and 2010 National Population Censuses.

Description of the study area

Patagones is the southernmost and the largest district of the Buenos Aires province of Argentina, with an area of 13,597 km^2 (see Figure 1). The whole district has a population of 30,806 inhabitants, while its rural areas have only 3042 inhabitants. The main cities are Carmen de Patagones (20,533 inhabitants), Stroeder (1998 inhabitants) and Villalonga (4517 inhabitants).

The climate in the area is a transition zone from an arid to semi-arid environment, with alternating cycles of deficient and excess precipitation. The extremes are mostly drought events (see Figure 2). The average precipitation in the region is 400 mm/year (Gabella & Campo, 2016a). The area can also be subdivided on the basis of differences in temperature and soil development (Sánchez, Pezzola, & Cepeda, 1998). Edaphic limits are related to annual water shortages and erosive winds (Peña Zubiate, Anderson, & Demmi, 1998). The native vegetation of the district constitutes an ecotone between the phytogeographic provinces of shrub land and thorny scrubland (Bruniard, 2004; Cabrera, 1971, 1976; Villagra et al., 2004).

Today the productive dynamic of the Patagones rural dry areas is based on farming and livestock activities. The 63º meridian divides the district into two. The east, an area of approximately 510,000 ha with little vegetation, is dedicated to wheat production. To the west there is an area of native shrubland mainly under extensive stockbreeding, raising and fattening (Iurman, 2009; Zingoni & Bustos Cara, 2007). A more humid period began between 1970

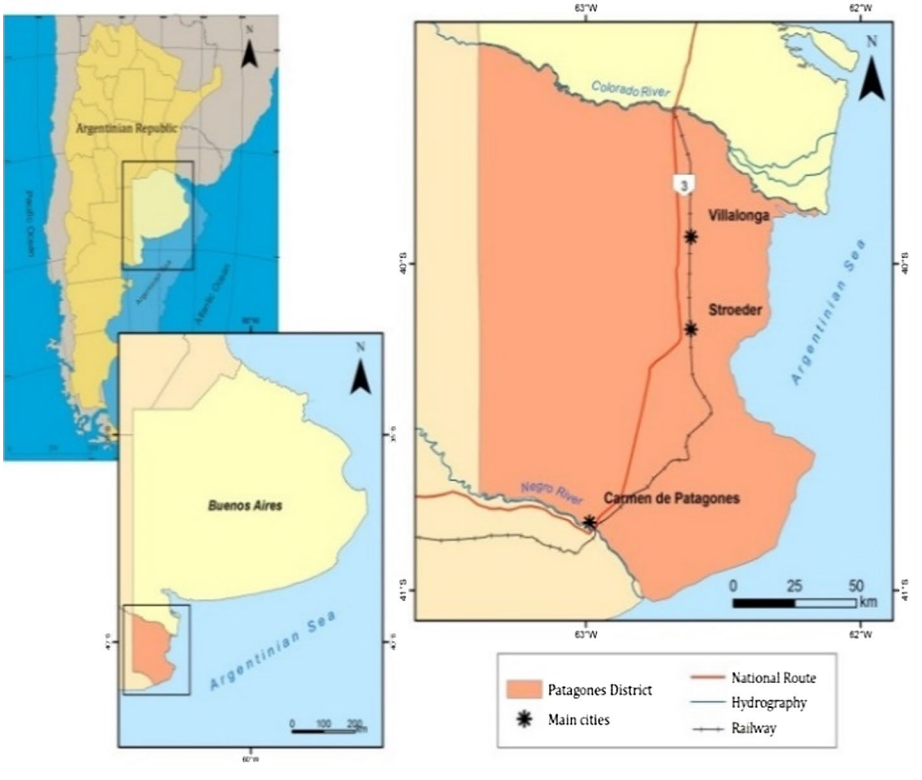

Figure 1. Study area.
Note: By Julia Gabella on the basis of cartography by IGN (http://www.ign.gob.ar/) 2014.

and 1990 in the semi-arid Pampean region which also affected the Patagones district (Campo De Ferreras, Capelli De Steffens, & Diez, 2004; Gabella, Zapperi, & Campo, 2010). Variations in rainfall caused the gradual expansion of the agricultural frontiers and this advance intensified in the region in the following decades (Morello et al., 2000; Viglizzo & Jobbágy, 2010; Viglizzo, Roberto, Lertora, López Gay, & Bernardos, 1997; Viglizzo et al., 2009). In Patagones, this expansion was behind the deforestation of the native forest (Pezzola, Agamennoni, & Winschel, 2009; Pezzola, Winschel, & Agamennoni, 2012; Pezzola, Winschel, & Sanchez, 2004) and the development of agriculture using methods and techniques which are often damaging the environment (Krüger, 2013). Deforestation was also incentivised by the government, with state-backed credit being offered to farmers to deforest their land (Gabella, 2014). Agricultural dry land represented 25.7% of the total area in 1975. In 2009, this proportion had risen to 49.1%. By 2009, native vegetation had been reduced to covering 30% of the total area in the district (Iurman, 2009) and by 2011, this percentage was reduced to 20%, with 153,263 ha of deforestation in just two years (see Table 1). The ecosystem has been transformed from a species-rich system to a specialised system with low species richness and loss of system function (Gabella, 2015).

The variability in precipitation is a recurring factor which has caused increasing problems in the region and serious socio-economic consequences for farmers (Gabella & Zimmermann, 2016). Extreme droughts such as the 2005–2009 one (see Table 2) have created a critical crisis in the whole area (Ferrelli, 2012; Gabella & Campo, 2016a). In addition to these types of management practices, the lack of public policies targeting land use planning only furthered the environmental degradation of the area (Gabella & Zimmermann, 2016).

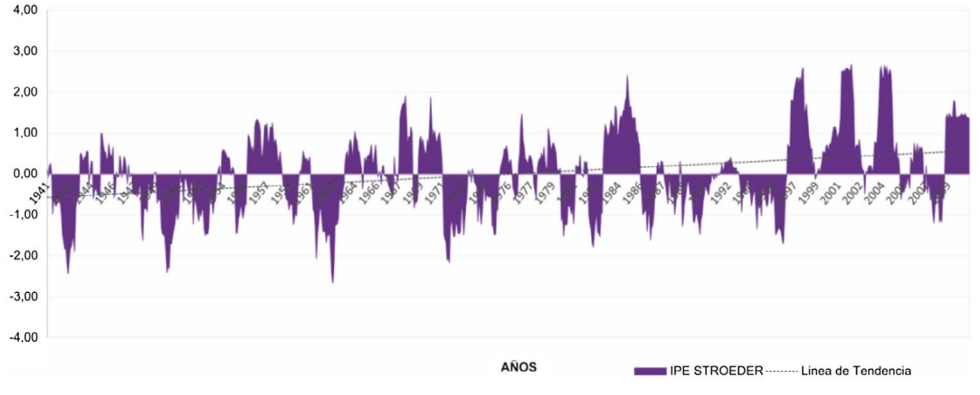

Figure 2. Standardised precipitation index (SPI) Patagones district (1940–2010).
Note: By Gabella and Campo (2016a).

Table 1. Deforestation of the native forest in Patagones district 1975–2011 (Gabella, 2015).

Year	Native vegetation area (ha)	% Native vegetation area
1975	911,171	65
1987	682,367	49
1999	554,138	40
2002	524,629	37
2005	437,134	31
2009	432,280	30
2011	279,017	20

Table 2. Annual average precipitation of Patagones district (2000–2010) (Gabella & Campo, 2016a).

Year	Annual precipitation (mm)
2000	428
2001	717
2002	383
2003	429
2004	744
2005	289
2006	436
2007	280
2008	217
2009	215
2010	544

Observations and discussions

Defence is not enough: Patagones as a non-sustainable area

After many years of fieldwork, certain phenomena can be observed in Patagones which reveal that the management of the area is not sustainable. The three main spheres of the rural system are not connected and the degree of vulnerability is therefore high. The persistence of unfeasible production models, the farming community's resistance to change to adapt to new scenarios, low participation and collective commitment are easy to observe. National and regional policies are directed at maintaining the current mode of production, with unsuccessful interventions to make it more sustainable. This implies continuing with the same production logic: producing wheat and trying to obtain better harvests, good international prices for grain and livestock, and persisting in farming the area, on the assumption of favourable weather (Gabella & Campo, 2016b). The situation can be clearly defined by what Allison and Hobbs (2004) explain as a blocking situation, which is characterised by a low potential for change, a high degree of connection between the structural variables and, due to the extremely degraded state, a large resilience to change.

The connections between climate variability and the productive management model adopted by the colonising culture in the Patagones district are essential when trying to understand the processes and dynamics of this territory. The original settlers were from an agrarian culture, deeply rooted in wheat crops and the use of traditional tools such as the ploughshare and mouldboard, but they found a densely forested land, which needed clearing to cultivate it (Zarrilli, 2010).

Since this rural space was first occupied, there has been no connection between the natural environment and the exploitation systems used. The lack of adaptation to unpredictable weather conditions had serious socio-economic consequences. Precipitation variability and productive mismanagement were recurrent factors. Throughout history these recurrent factors caused increasing problems in the region. Even today, the small- and medium-sized farmers are still confronted by the same issues of vulnerability due to the conflict between climate and their production logic not being compatible with the natural environment. Farmers usually regard every radical innovation with scepticism, doubt, prejudice and concern. In arid and semi-arid agro ecosystems in particular, small farmers' decision-making process is conducted under conditions of uncertainty where it becomes impossible to assess the likelihood of the occurrence of certain events. The attachment to 'traditional techniques'

is not an irrational attitude but a proven method to minimise uncertainty and avoid total loss and disintegration of productive units (Allub, 2001).

The farmers' perceptions of extreme climate events, particularly droughts, should also be noted. Though such events recur regularly, farmers tend to ignore this when making decisions about the future of farming. Farmers tend to think that they were circumstantial or that they will not repeat with the same magnitude. In some cases, they even forget such events and expect conditions to improve (Sleger, 2008).

Debate and discussion on the environmental issues suggest two perspectives on the same problem. On the one hand, anthropic action causes degradation but on the other hand, humans feel they are victims of the environment. While scientists and local experts state that the fall in land productivity in Patagones district is due to soil degradation resulting from bad farming practices, farmers insist that it is the lack of precipitation which causes their problems. Some of the statements recorded in interviews conducted during field trips reflect this view:

> The problem is that the farmer has a production logic which is usually wrong. The severe drought was a catalyst, which hastened the degradation process. It sped up a process which had already been developing.[1]

> I do not know what we need, it is the weather that kills us. I do not know what we can implement; I do not know what can be done. The weather has treated us brutally. Let's have faith and think that this is temporary and that the rain will come soon.[2]

> The district's problem is climatic. If it rained, I would be fine. Irrigation would be a quick solution. If irrigation was brought, we would have a solution. I do not want to have all my land irrigated, I would produce to feed my cows.[3]

> There has not been enough rainfall for a long time. The level of rainfall of recent years makes it really difficult for us to produce. The last drought was extremely long and severe and it was not in our calculations or predictions.[4]

> Here, the most serious problem is climatic. They say wheat cannot be produced but it is a quick alternative; you sow it and within a few months and with a few hectares you can get back on your feet again. You need more hectares for cattle.[5]

> I hate bush land, either in my own land or in rented land, I weed it and leave nothing […] you cannot work, it sucks the soil dry.[6]

> A lot of people offer their opinion even if they have no knowledge. People from the city, a lot of experts and engineers who came from other places think that this is a simple problem to solve […] It is easy to give your opinion and then do nothing under those circumstances.[7]

Since 2001, the district government has declared many emergencies and agricultural disasters. There is a provincial law (Law 10.390) which provides for access to assistance mechanisms with specific public financial aid for affected farmers (benefits in form of credit and tax relief). After 2009 (during a period of extreme drought) the national government granted funds for the purchase of seeds and fodder. In 2012 the Federal Ministry of Agriculture provided two modern planting machines for small- and medium-sized farms to the municipality of Patagones, to promote the adoption of new technologies and their communal use. These examples demonstrate that policies are not designed at the local level. They are directed and framed within national plans or regional projects into which the district is inserted. They are also not suited to the needs of the community and do not take the weather into account.

Sectorial policies are partial solutions which mostly focus on specific types of production (mainly wheat), oriented to short and medium-term production objectives. Most are implemented through aid policies (Romero Wimer, 2012), without taking into account the local environmental conditions. These palliative measures demonstrate the absence of a common long-term, viable, sustainable and consensual goal between all the local actors involved. The area is viewed as a platform for productive activities and in many cases has lost its sense of belonging because of the absence of an original rural population (Gabella, 2016).

The absence of a policy based on the development of the rural area did little to facilitate levels of coordination between institutions. Many institutions such as the INTA, the Ministry of Agrarian Affairs or the Municipality overlapped and duplicated their work in rural areas and with groups of farmers (Gabella, 2016). Although according to what the various public and private entities, agencies and institutions said, there is great apparent concern for the future of the rural communities, many rural areas in Patagones are in a process of decline. Nevertheless, some of these institutions' policies and programmes reflect ideas of sustainability and rural territorial development: Federal Support Programme for Sustainable Rural Development (PROFEDER) (http://inta.gob.ar/documentos/profeder-programa-federal); Development plan for Southwest Buenos Aires Province (http://www.gob.gba.gov.ar/legislacion/legislacion/l-13647.html); and Regional Projects with Territorial Approach (PRET); and Innovation management for the development of the semi-arid territory in the drylands of Buenos Aires (http://inta.gob.ar/proyectos/BASUR-1272308). Despite the implementation of different plans and programmes linked to the rural area, these are a long way from being effective in enabling development in the region (Gabella, 2016; Gabella & Álamo, 2013).

Reactive policy and command and control management in response to crises have dominated the district, with each new policy responding to the effects (side-effects or unintended effects) of the previous policy. Defence is not enough and was clearly not successful. The current situation has many characteristics of the 'lock-in' concept (Arthur, 1989; Wilson, 2014). Once a technique or system has come into being, it is sometimes difficult to change, as that requires 'substantial investment'. An example of this is the agricultural intensification involving technological change, which largely masked the degradation of natural resources and helped create a perceived stability in the system. Technological advances result in discrete variable interventions or create interventions without regard for their impacts on other parts of the system. The problems observed in the study area cannot be solved with small steps, they require more radical changes which are not easy to achieve.

We observe that the current situation in Patagones district involves three aspects of the same reality. First, the ecological aspect, which refers to changes in soil characteristics causing desertification and loss of biodiversity. Second, the economic aspect, with increasing indebtedness in small- to medium-sized farmers, a lack of alternative employment and their consequent rural impoverishment. Third, the social aspect, which manifests itself in rural exodus, land abandonment (or absorption into large farms) and the loss of cultural values and traditions as the traditional local population moves away (Gabella & Zimmermann, 2016). A reduction in the quality of natural resources often goes hand-in-hand with the loss of resilience at both local and regional levels (Kelly et al., 2015). Some statements recorded in interviews reflect this critical situation:

> The situation is very critical: politically and climatically. There's no answer to all the demands, and although there are some pay rises, they are not enough. There is no credit available and the costs of producing in this area are very high.[8]

> We have serious problems, we do not have infrastructure, for example fences, and our input costs today are very high. Times are hard for most farmers, and we have learned to survive.[9]

> Significant changes are not made, it is difficult to change the mentality of farmers: even from generation to generation, there is a tendency to follow in one's father's footsteps.[10]

> People are very discouraged, older farmers have given up. The elderly no longer have the strength or the energy to keep on fighting and no longer want to complicate their lives, so they sell up their properties to other people, some from places far from the district.[11]

> The trend is still as it was in recent years: gradually there are fewer farmers who are able to live in the countryside, because when their children need to go to secondary school, they need to be in town, because there is no way for the children to come and go to town. And over time the family moves to the nearest town and stops living in the countryside.[12]

> Today we are experiencing a return-of-land concentration. The problem is inheritance and the subdivision of holdings. If smallholders get into debt they sell their fields to foreigners.[13]

> The boys have to study, unfortunately, we will be alone. There are only old people in the villages. My boys are gone. This is changing for the worse. Soon there will be a social problem, and this town will become a ghost town. Those who stay on the farms can see that there are no prospects for work.[14]

Although some farmers interviewed in the Patagones district demonstrated a certain capacity to cope with the ongoing economic and climatic crisis, their adaptive capacity was at the expense of ecosystem services, such as through the intensification of production. This only remained possible for these farmers because they continued to have land or financial capacity in reserve. The challenge, therefore, is to increase social wellbeing while sustaining ecological services.

Resilience thinking in semi-arid rural areas of Pampean region: adaptation is the key

Contrary to this sustainability approach, from the resilience perspective and following the model of rural resilience based on the three interconnected aspects of economic, ecological and cultural spheres (Heijman et al., 2007), and on the four principles which build resilience in social-ecological systems (Folke et al., 2003), we propose the alternative approach, of making the semi-arid rural areas of the Pampean region more resilient.

In the ecological domain, it is important to understand the climatic characteristics of semi-arid rural areas dedicated to agriculture and livestock. Regional studies (Campo, Ramos, & Zapperi, 2009; Gabella, Gil, & Del Pozo, 2009; Gabella et al., 2010; Gil, Zapperi, Campo, Iuorno, & Ramborger, 2008) have found that the area has naturally variable wet and dry cycles. This information helps farmers to understand that it is necessary to diversify production and to have diverse sources of income. Periods of drought in a diversified system will not destroy farmers' economic viability because they can rely on other activities to generate other economic income. This is why multifunctionality in rural communities is so important, especially if it is applied at the farm level, as that is the most important spatial scale for the implementation of multifunctionality (Wilson, 2009).

Diversity is an important aspect of farmers' capacity to build social-ecological resilience. A high degree of specialisation reduces the ability of a system to adapt. Diversifying production is associated with crops which are adapted to the climatic and edaphic conditions

in an area. It is also important to analyse which internal or external markets are available to sell these products. It is possible in this context to propose alternative productive activities such as aromatic plants, olive trees, almond trees and capers. Rural tourism and agrotourism are also potential sources of income and are activities which could further contribute to diversification in the area. Diversity is also important socially. Increasing the diversity of the actors in an area can introduce new ways of thinking and expand the role of information, education and dialogue.

From an ecological and productive perspective it is necessary to develop a forestry plan for the area. The use of forest resources could lead to a more comprehensive view on native forests, not only in dealing with production but also with aspects of conservation. In terms of diversification it is also important to have greater production diversification in the extensive livestock farming in the shrubland, with sheep and pig farming and beekeeping. It would be useful to have a comprehensive management plan with crop rotation, pasture management, mixed systems and the implementation of more sustainable production practices.

To become a resilient area, specific and transdisciplinary research is needed to provide in-depth information for the prevention of land erosion and degradation due to the impact of climate variability. Moreover, an environmental monitoring and early warning system would be the basis for permanent feedback loops and the process-based improvement of development. It will therefore be necessary to expand the quantity and quality of the network of agro-meteorological stations to include constant satellite data and image processing and the production and maintenance of specific and thematic maps of the area.

Another important aspect of a resilient area is the combination of different types of accessible knowledge. Farmers would thus be able to combine different knowledge systems and thereby use knowledge developed on their own farm with knowledge developed by research institutions or knowledge from other sources. Farmers who communicate, discuss and exchange results from experiments will expand this knowledge into networks and institutions. A very important aspect to consider is related to the access to information (especially since the last CNA 2002). It is important to have reliable and updated data which can objectively reflect the current situation.

Social factors are also crucial for resilience because they mediate the relationship between the socio-economic and environmental components of the system. This includes levels of interaction between community members such as trust, relationships, conflict-resolution processes, engagement of young and old people, learning and communication pathways, cooperation, and the strength of networks (Kelly et al., 2015). The involvement and commitment of the regional and local actors is essential to support transition and achieve change. It is necessary and essential to have stakeholders who are responsible and visionary, who are able to establish connections, links and networks, bringing together as many actors in the territory as possible. Resilient rural settlement patterns should be encouraged, avoiding the exploitation of the area by only focusing on industrial agricultural production. It is important to design a programme which is closely focused on social issues and which values local cultures and creates opportunities by promoting new economic options and projects supporting the local level. Social and cultural activities need to be strengthened in order to guarantee access to basic services and information based on an inclusive approach.

Conclusions

The aim of the paper was to analyse semi-arid rural areas in Argentina through the lens of resilience. We provided a framework for the exploration of sustainability and resilience concepts and we argued that sustainability is about defence, while resilience is about adaptation. Although this paper is based on a case study, the findings suggest that the use of the concept of resilience can help us understand the adverse effects of rural policies in Argentina.

The results of this study show that many rural areas of the semi-arid Pampean region are deteriorating. The negative socio-territorial and environmental effects of the development models introduced there in the past can be easily observed. The management processes were and continue to be largely conditioned by economic, political and sociocultural factors. Most of the actions (public policies) implemented in the region have not promoted significant and positive changes in the community and the environment. In some cases, once a policy produces its expected changes, it tends to try to preserve it. This is effectively a sustainability bias. Defensive strategies are not enough in the face of the current crisis. What is even worse, where there are new underlying conditions which require adaptation, we can observe public policies which tend to block efforts to achieve resilience.

But if we know that the frameworks and policies related to the concept of sustainability have been proven not to work, why do we keep using the same policies, governance and research tools? The answer may be related to the strategies promoted by international organisations and the centres of political and economic power which have determined Argentina's macroeconomic policies. Rural areas are absorbed into the national and provincial contexts, which regulate and determine their evolution and functioning over time. Policies, programmes and projects, as well as conceptual approaches, intervention methodologies, tools and techniques, have thus been conditioned by agencies and institutions of international and national order. Political factors are broadly linked to the predominant ideologies and worldviews held by local, regional and national decision-makers (Kelly et al., 2015). Ideas are copy-pasted without concrete measures being developed from local experience. General models are copied and followed without ever identifying the local needs and urgencies. What is striking is that there is very little criticism calling for the measures implemented to be reconsidered, despite their having so far failed to achieve positive results.

We have shown that the time-dependent nature of the problems in economic ecological systems, the transformations in interrelated human and natural systems, and mismatches of scale between human responsibility and natural interactions have contributed to a 'lock-in trap'. Defending the system from external crises is not enough to achieve resilience. We need to think about adapting to improve the quality of people's lives and the environment in the semi-arid rural areas of the Argentinean Pampean region.

Notes

1. Interview with an Agronomist of the INTA, Hilario Ascasubi, in August 2013.
2. Interview with a farmer from Patagones district in his agricultural establishment, in March 2015.
3. Interview with a farmer from Patagones district, at the Rural Society of Stroeder, in August 2013.
4. Interview with a son of a farmer in Patagones district, at his workplace, in March 2013.
5. Interview with a farmer from Patagones district in his agricultural establishment in November 2013.
6. Interview with a farmer from Patagones district, at the Rural Society of Stroeder, in April 2014.

7. Interview with a farmer from Patagones district, at his home in Patagones, in March 2015.
8. Interview with a farmer from Patagones district at his agricultural establishment, in April 2014.
9. Interview with a farmer from Patagones district, at the Rural Society of Stroeder, in August 2013.
10. Interview with an Agronomist from the INTA, Hilario Ascasubi, in August 2013.
11. Interview with an Agronomist of the INTA, in Patagones, in April 2015.
12. Interview with a stakeholder from Patagones district, at his home in Patagones, in April 2015.
13. Interview with the Secretary of Economic Development of the municipality of Patagones, at his office in Patagones, in March 2014.
14. Interview with a farmer of Patagones district, at the Rural Society of Stroeder, in August 2013.

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No potential conflict of interest was reported by the authors.

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References

Adger, W. (2000). Social and ecological resilience: Are they related? *Progress in Human Geography, 24*(3), 347–364. doi:10.1191/030913200701540465

Alary, V., Nefzaoui, A., & Ben Jemaa, M. (2007). Promoting the adoption of natural resource management technology in arid and semi-arid areas: Modelling the impact of spineless cactus in alley cropping in Central Tunisia. *Agricultural Systems, 94*(2), 573–585. doi:10.1016/j.agsy.2007.02.003

Allison, H. E., & Hobbs, R. J. (2004). Resilience, adaptive capacity, and the 'Lock-in Trap' of the Western Australian agricultural region. *Ecology and Society, 9*(1), 3.

Allub, L. (2001). Aversión al riesgo y adopción de innovaciones tecnológicas en pequeños productores rurales de zonas áridas: Un enfoque causal. *Estudios Sociológicos, XIX*(2), 467–493.

Andrade, M. I., Laporta, P., & Iezzi, L. (2009). Sequías en el sudoeste bonaerense: Vulnerabilidad e incertidumbre. *Geograficando, 5*(5), 1–21. Retrieved from http://www.geograficando.fahce.unlp.edu.ar/article/view/GEOv05n05a10/3618

Arthur, W. B. (1989). Competing technologies, increasing returns, and lock-in by historical small events. *The Economic Journal, 99*(394), 116–131.

Benson, M., & Craig, R. (2014). The end of sustainability. *Society and Natural Resources, 27*, 777–782. doi:10.1080/08941920.2014.901467

Bjorkhaug, H., & Richards, C. A. (2008). Multifunctional agriculture in policy and practice? A comparative analysis of Norway and Australia. *Journal of Rural Studies, 24*(1), 98–111. doi:10.1016/j.jrurstud.2007.06.003

Bogdan, R., & Taylor, S. (1994). *Métodos cualitativos de investigación*. Barcelona: Paidós.

Bossio, D., Geheb, K., & Critchley, W. (2010). Managing water by managing land: Addressing land degradation to improve water productivity and rural livelihoods. *Agricultural Water Management, 97*(4), 536–542. doi:10.1016/j.agwat.2008.12.001

Bousquet, F., Botta, A., Alinovi, L., Barreteau, O., Bossio, D., Brown, K., … Dessard, H. (2016). Resilience and development: Mobilizing for transformation. *Ecology and Society, 21*(3), 40. doi:10.5751/ES-08754-210340

Bruniard, E. (2004). *Clima, paisaje y geografía*. Corrientes: Editorial Universitaria.

Cabrera, A. (1971). Fitogeografía de la República Argentina. *Boletín de la Sociedad Argentina de Botánica,XIV*, 1–42.

Cabrera, A. (1976). Enciclopedia Argentina de Agricultura y Jardinería. *Regiones Fitogeográficas Argentinas,1*(II), 1–85.

Campo De Ferreras, A., Capelli De Steffens, A., & Diez, P. (2004). *El clima del Suroeste Bonaerense*. Bahía Blanca: EdiUNS.

Campo, A., Ramos, M. B., & Zapperi, P. (2009). Análisis de las variaciones anuales de precipitación en el Suroeste bonaerense, Argentina. Paper presented at the XII Encuentro de Geógrafos de América Latina (EGAL), Montevideo, April, 1–12.

Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: Resilience of what to what? *Ecosystems, 4*(8), 765–781. doi:10.1007/s10021-001-0045-9

Carpenter, S., Westley, F., & Turner, G. (2005). Surrogates for resilience of social–ecological systems. *Ecosystems, 8*(8), 941–944. doi:10.1007/s10021-001-0045-9

Carrión, J., Fernández, S., Jiménez-Moreno, G., Fauquette, S., Gil-Romera, G., Gonzalez-Samperiz, P., & Finlayson, C. (2010). The historical origins of aridity and vegetation degradation in southeastern Spain. *Journal of Arid Environments, 74*(7), 731–736. doi:10.1016/j.jaridenv.2008.11.014

Cocklin, C., Mautner, N., & Dibden, J. (2007). Public policy, private landholders: Perspectives on policy mechanisms for sustainable land management. *Journal of Environmental Management, 85*(4), 986–998. doi:10.1016/j.jenvman.2006.11.009

Cuéllar-Padilla, M., & Calle-Collado, A. (2011). Can we find solutions with people? Participatory action research with small organic producers in Andalusia. *Journal of Rural Studies, 27*(4), 372–383. doi:10.1016/j.jrurstud.2011.08.004

Darnhofer, I., Lamine, C., Strauss, A., & Navarrete, M. (2016). The resilience of family farms: Towards a relational approach. *Journal of Rural Studies, 44*, 111–122. doi:10.1016/j.jrurstud.2016.01.013

Davidson, D. (2010). The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society & Natural Resources, 23*(12), 1135–1149. doi:10.1080/08941921003652940

Davoudi, S., Shaw, K., Haider, L., Quinlan, A., Peterson, G., Wilkinson, C., … Porter, L. (2012). Resilience: A bridging concept or a dead end? "reframing" resilience: Challenges for planning theory and practice interacting traps: Resilience assessment of a pasture management system in Northern Afghanistan urban resilience: What does it mean in planning practice? Resilience as a useful concept for climate change adaptation? The politics of resilience for planning: A CAUTIONARY NOTE. *Planning Theory & Practice, 13*(2), 299–333. doi:10.1080/14649357.2012.677124

Derissen, S., Quass, M., & Baumgartner, S. (2011). The relationship between resilience and sustainability of developing societies. *Ecological Economics, 70*(6), 1121–1128. doi:10.1016/j.ecolecon.2011.01.003

Easdale, M., & Rosso, H. (2010). Dealing with drought: Social implications of different smallholder survival strategies in semi-arid rangelands of Northern Patagonia, Argentina. *The Rangeland Journal, 32*(2), 247–255. doi:10.1071/RJ09071

Ferrelli, F. (2012). La sequía 2008–2009 en el Sudoeste de la provincia de Buenos Aires (Argentina). *Ecosistemas, 21*(1–2), 235–238. Retrieved from https://www.revistaecosistemas.net/index.php/ecosistemas/article/view/370

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change, 16*(3), 253–267. doi:10.1016/j.gloenvcha.2006.04.002

Folke, C., Carpenter, S.,Elmqvist, T., Gunderson, L., Holling, C. S., Walker, B., … Ohlsson, L. (2002). *Resilience and sustainable development: Building adaptive capacity in a world of transformations*. Stockholm: Scientific Background Paper on Resilience for the process of The World Summit on Sustainable Development on behalf of The Environmental Advisory Council to the Swedish Government. Retrieved from www.mvb.gov.se

Folke, C., Colding, J., & Berkes, F. (2003). *Navigating social-ecological systems: Building resilience for complexity and change*. Cambridge: Cambridge University Press.

Freshwater, D. (2015). Vulnerability and resilience: Two dimensions of rurality. *Sociologia Ruralis, 55*(4), 497–515. doi:10.1111/soru.12090

Frost, P., Campbell, B., Luckert, M., Mandondo, A., & Kozanayi, W. (2007). In search of improved rural livelihoods in Semi-Arid regions through local management of natural resources: Lessons from case studies in Zimbabwe. *World Development, 35*(11), 1961–1974. doi:10.1016/j.worlddev.2006.11.012

Gabella, J. (2014). Gestión territorial y degradación ambiental en áreas rurales de la Diagonal Árida Templada Argentina. Partido de Patagones, provincia de Buenos Aires (PhD diss.), National University of the South. Retrieved from http://repositoriodigital.uns.edu.ar/bitstream/123456789/534/1/TESIS%20DOCTORAL%20GABELLA%202014.pdf

Gabella, J. (2015). Dinámicas territoriales conducentes a la degradación ambiental en áreas rurales del sur de la región pampeana argentina. *HALAC, IV*(2), 201–216. Retrieved from http://revistas.unicentro.br/index.php/halac/article/view/3704

Gabella, J. (2016). Instituciones, políticas públicas y desarrollo territorial en áreas rurales del partido de Patagones, provincia de Buenos Aires. *Revista Universitaria de Geografía, 25*(2), 167–191. Retrieved from http://www.scielo.org.ar/pdf/reuge/v25n2/v25n2a07.pdf

Gabella, J., & Álamo, M. (2013). La incidencia de las políticas agropecuarias en el desarrollo rural del partido de Patagones en los últimos diez años (2003–2013). *Revista Interdisciplinaria de Estudios Sociales, 7*, 11–39.

Gabella, J., & Campo, A. (2016a). Fragilidad y degradación ambiental en áreas rurales de la diagonal árida templada argentina. *Estudios Geográficos, 281*, 491–519. doi:10.3989/estgeogr.201616

Gabella, J., & Campo, A. (2016b). Procesos de ocupación y construcción del espacio rural pampeano: El partido de Patagones. *Revista Huellas, 20*, 79–99. doi:10.19137/huellas-2016-2005

Gabella, J., Gil, V., & Del Pozo, O. (2009). Historia Ambiental del área rural de Pelicurá, sobre la base de registros pluviométricos. Partido de Tornquist, provincia de Buenos Aires. *Revista Universitaria de Geografía, 18*, 81–104. Retrieved from http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1852-42652009000100005

Gabella, J., Zapperi, P., & Campo, A. (2010). Distribución estacional de las precipitaciones en el Suroeste Bonaerense. Paper presented at the VII Jornadas Nacionales de Geografía Física de la República Argentina, Posadas, July, 87–94.

Gabella, J., & Zimmermann, F. (2016). Territorial management, environmental degradation and resilience in rural areas of the Argentinian temperate arid diagonal. *American Journal of Rural Development, 4*(2), 49–58. doi:10.12691/ajrd-4-2-3

Gaber, J., & Gaber, S. (2007). *Qualitative analysis for planning & policy. Beyond the numbers*. Chicago, IL: Planners press, American Planning Association.

Gil, V., Zapperi, P., Campo, A., Iuorno, V., & Ramborger, A. (2008). Análisis de las precipitaciones de otoño y primavera en el Suroeste bonaerense. Paper presented at the VII Jornadas de Geografía Física, San Salvador de Jujuy, July, 1–12.

Gunderson, L. (2000). Ecological resilience—in theory and application. *Annual Review of Ecology and Systematics, 31*, 425–439. Retrieved from https://www.uv.mx/personal/tcarmona/files/2010/08/Gunderson-2000.pdf

Heijman, W., Hagelaar, G., & Heide, M. (2007). Rural resilience as a new development concept. Paper presented at the 100th Seminar of EAAE, Novi Sad, June, 383–396.

Hoggart, K., & Paniagua, A. (2001). The restructuring of rural Spain? *Journal of Rural Studies, 17*(1), 63–80. doi:10.1016/S0743-0167(00)00037-1

Holmes, H. (2006). Impulses towards a multifunctional transition in rural Australia: Gaps in the research agenda. *Journal of Rural Studies, 22*(2), 142–160. doi:10.1016/j.jrurstud.2005.08.006

Hurni, H. (2000). Assessing sustainable land management (SLM). *Agriculture, Ecosystems and Environment, 81*(2), 83–92. doi:10.1016/S0167-8809(00)00182-1

Imperiale, A., & Vanclay, F. (2016). Experiencing local community resilience in action: Learning from post-disaster communities. *Journal of Rural Studies, 47*(A), 204–219. doi:10.1016/j.jrurstud.2016.08.002

Iurman, D. (2009). *Diagnóstico y evaluación económica de alternativas tecnológicas para productores agropecuarios familiares de la zona de secano del partido de Patagones* (Mg. Diss.), National University of the South. Retrieved from http://repositoriodigital.uns.edu.ar/bitstream/123456789/2027/1/Iurman-daniel-tesis.pdf

Kasperson, J., & Kasperson, R. (2001). *Global environmental risk*. London: University Press-Earthscan.

Kelly, C., Ferrara, A., Wilson, G., Ripullone, F., Nolè, A., Harmer, N., & Salvati, L. (2015). Community resilience and land degradation in forest and shrubland socio-ecological systems: A case study in Gorgoglione, Basilicata region, Italy. *Land Use Policy, 46*, 11–20. doi:10.1016/j.landusepol.2015.01.026

Krüger, H. (2013). Sustentabilidad. Interpretación conceptual y problemas observados en el Centro y Sur de la provincia de Buenos Aires. *Publicaciones Regionales, 19*, 29.

Kummer, S., Milestad, R., Leitgeb, F., & Vogl, C. (2012). Building resilience through Farmers' experiments in organic agriculture: Examples from Eastern Austria. *Sustainable Agriculture Research, 1*(2), 308–321. doi:10.5539/sar.v1n2p308

Madsen, L., & Adriansen, H. K. (2004). Understanding the use of rural space: The need for multi-methods. *Journal of Rural Studies, 20*(4), 485–497. doi:10.1016/j.jrurstud.2003.12.005

McManus, P., Walmsley, J., Argent, N., Baum, S., Bourke, L., Martin, J., … Sorensen, T. (2012). Rural community and rural resilience: What is important to farmers in keeping their country towns alive? *Journal of Rural Studies, 28*(1), 20–29. doi:10.1016/j.jrurstud.2011.09.003

Morello, J., Buzai, G., Baxendale, C., Rodríguez, A., Matteucci, S., Godagnone, R., & Casas, R. R. (2000). Urbanization and the consumption of fertile land and other ecological changes: The case of Buenos Aires. *Environment and Urbanization, 12*(2), 119–131. doi:10.1177/095624780001200210

Peña Zubiate, C., Anderson, D., & Demmi, M. (1998). *Carta de suelos y vegetación de la provincia de San Luis*. San Luis: INTA.

Pezzola, A., Agamennoni, R., & Winschel, C. (2009). *Estimación expeditiva de suelos erosionados del partido de Patagones. Provincia de Buenos Aires*. Buenos Aires: INTA.

Pezzola, A., Winschel, C., & Agamennoni, R. (2012). Cuantificación de la erosión bioclimática en ambientes semiáridos: Caso partido de Patagones en el sur de la provincia de Buenos Aires, utilizando percepción remota. Paper presented at the IX Jornadas de Geografía Física, Bahía Blanca, April, 124–129.

Pezzola, A., Winschel, C., & Sanchez, R. (2004). *Estudio multitemporal de la degradación del monte nativo en el partido de Patagones*. Hilario Ascasubi: INTA.

Pierce, J. (1996). The conservation challenge in sustaining rural environments. *Journal of Rural Studies, 12*(3), 215–229. doi:10.1016/0743-0167(96)00019-8

Reed, A., & Dougill, A. (2010). Linking degradation assessment to sustainable land management: A decision support system for Kalahari pastoralists. *Journal of Arid Environments, 74*(1), 149–155. doi:10.1016/j.jaridenv.2009.06.016

Rist, E., Rista, S., Chidambaranathan, M., Escobar, C., Wiesmann, U., & Zimmermann, A. (2007). Moving from sustainable management to sustainable governance of natural resources: The role of social

learning processes in rural India, Bolivia and Mali. *Journal of Rural Studies, 23*(1), 23–37. doi:10.1016/j.jrurstud.2006.02.006

Romero Wimer, F. (2012). *Producción familiar rural y políticas en la Argentina reciente. Los programas de Desarrollo Rural en el Sudoeste Bonaerense*. Bahía Blanca: Editorial CEISO.

Sánchez, R., Pezzola, A., & Cepeda, J. (1998). *Caracterización edafoclimática del área de influencia del INTA E.E.A. Ascasubi*. Buenos Aires: INTA.

Scott, M. (2013). Resilience a conceptual Lens for rural Studies? *Geography Compass, 7*(9), 597–610. doi:10.1111/gec3.12066

Sharachchandra, L. (1991). Sustainable development: A critical review. *World Development, 19*(6), 607–621. Retrieved from https://edisciplinas.usp.br/pluginfile.php/105953/mod_resource/content/9/texto_1.pdf

Sleger, M. (2008). If only it would rain. Farmer's perceptions of rainfall and drought in semi-arid central Tanzania. *Journal of Arid Enviroment, 72*(11), 2106–2123. doi:10.1016/j.jaridenv.2008.06.011

Van Lier, H. (1998). The role of land use planning in sustainable rural systems. *Landscape and Urban Planning, 41*(2), 83–91. doi:10.1016/S0169-2046(97)00061-3

Verdoodt, A., Mureithia, S., Ye, L., & Van Ransta, E. (2009). Chronosequence analysis of two enclosure management strategies in degraded rangeland of semi-arid Kenya. *Agriculture, Ecosystems and Environment, 129*(1–2), 332–339. doi:10.1016/j.agee.2008.10.006

Viglizzo, E., & Jobbágy, E. (2010). *Expansión de la frontera agropecuaria en Argentina y su impacto ecológico-ambiental*. Buenos Aires: INTA.

Viglizzo, F., Jobbagy, E., Carreño, L., Frank, F., Aragón, R., De Oro, L., & Salvador, V. (2009). The dynamics of cultivation and floods in arable lands of Central Argentina. *Hydrology and Earth System Sciences Discussions, 13*, 491–502. doi:10.5194/hess-13-491-2009

Viglizzo, A., Pordomingo, J., Castro, M. G., & Lertora, F. (2003). Environmental assessment of agriculture at a regional scale in the Pampas of Argentina. *Environmental Monitoring and Assessment, 87*(2), 169–195. doi:10.1023/A:1024654316879

Viglizzo, E., Roberto, Z., Lertora, F., López Gay, E., & Bernardos, J. (1997). Climate and land use change in field-crop ecosystems of Argentina. *Agriculture, Ecosystems & Environment, 66*(1), 61–70. doi:10.1016/S0167-8809(97)00079-0

Villagra, P., Cony, M., Mantován, N., Rossi, B., González Loyarte, M., Villalba, R., & Marone, L. (2004). *Ecología y Manejo de los algarrobales de la Provincia Fitogeográfica del Monte* [Ecology and Management of the carob trees in the phytogeographic 'Monte' province]. La Plata: Editorial Universidad Nacional de La Plata.

Weissteiner, C., Boschetti, M., Böttcher, K., Carrara, P., Bordogna, G., & Brivio, P. (2011). Spatial explicit assessment of rural land abandonment in the Mediterranean area. *Global and Planetary Change, 79*(1–2), 20–36. doi:10.1016/j.gloplacha.2011.07.009

Wilson, G. (2009). The spatiality of multifunctional agriculture: A human geography perspective. *Geoforum, 40*(2), 269–280. doi:10.1016/j.geoforum.2008.12.007

Wilson, G. (2012). Community resilience, globalization, and transitional pathways of decision-making. *Geoforum, 43*(6), 1218–1231. doi:10.1016/j.geoforum.2012.03.008

Wilson, G. (2014). Community resilience: Path dependency, lock-in effects and transitional ruptures. *Journal of Environmental Planning and Management, 57*(1), 1–26. doi:10.1080/09640568.2012.741519

Wilson, G. (2017). Constructive tensions in resilience research: Critical reflections from a human geography perspective. *The Geographical Journal, 184*(1), 89–99. doi:10.1111/geoj.12232

WCED (World Commission on Environment and Development). (1987). *Brundtland commission*. Report of the World Commission on Environment and Development: Our Common Future. Retrieved from http://www.un-documents.net/ocf-a1.htm

Yayneshet, T., Eik, L., & Moe, S. (2009). The effects of exclosures in restoring degraded semi-arid vegetation in communal grazing lands in northern Ethiopia. *Journal of Arid Environments, 73*(4–5), 542–549. doi:10.1016/j.jaridenv.2008.12.002

Yin, R. (2003). *Case study research: Design and methods*. Thousand Oaks, CA: Sage Publications.

Zarrilli, A. (2010). *Ecología, capitalismo y desarrollo agrario en la región pampeana (1890–1950). Un enfoque histórico-ecológico de la cuestión agraria*. Málaga: EUNED.

Zingoni, J., & Bustos Cara, R. (2007). *Plan Estratégico Participativo de Desarrollo Turístico Sustentable del Partido de Patagones*. Buenos Aires: Secretaria de Turismo de la Nación.

Zwiers, S., Markantoni, M., & Strijker, D. (2016). The role of change- and stability-oriented place attachment in rural community resilience: A case study in south-west Scotland. *Community Development Journal*, 1–20. doi:10.1093/cdj/bsw020